

REMARKS/ARGUMENTS

In the Office Action mailed January 10, 2008, claims 1-12 were rejected. Additionally, claims 3, 5, 6, 8, 9, and 12 were objected to. In response, Applicants hereby request reconsideration of the application in view of the amendments and the below-provided remarks.

For reference, claim 1 is amended to include the limitation “having a membrane structure FBAR (1).” This language is drawn from claim 2, which is cancelled in this response. Claims 3, 4, 5, 6, 8, 9, and 12 are amended as suggested by the Examiner to clarify the claims.

Objections to the Specification

The Office Action objects to the use of “wolfram” in the specification. “Wolfram” is the name used in most countries to describe the element with the atomic number 74. In the United States, this element is referred to as “tungsten.” In the interest of clarity, Applicants amend the specification to replace each occurrence of “wolfram” with “tungsten” as suggested by the Examiner. It should be noted, however, that Applicants intend that references to “tungsten” should also encompass what most of the world calls “wolfram,” specifically, the element with the atomic number 74, along with isotopes and alloys of that element as known in the art.

Applicants submit that these amendments overcome the objections to the specification. Consequently, Applicants respectfully request that the objections to the specification be withdrawn.

Claim Objections

Claims 3, 5, 6, 8, 9, and 12 were objected to. The Examiner provided suggested amendments to the claims that would overcome these objections. These suggested amendments have been incorporated into the amended claims.

Specifically, the reference signs in parenthesis “(25, 26 or 22, 23)” in claim 3 are now located after “stack of conductive materials” to clarify the claim. Claims 5 and 6 are amended to include a comma after “stack” to correct typographical errors. Claim 8 is amended to change each occurrence of “wolfram” to “tungsten” as suggested by the

Examiner to be consistent with usage in the U.S. As described above, the scope of the claim as amended includes the use of what in many other countries is referred to as “wolfram.”

In addition, claim 9 is amended by removing “comminations” and replacing it with “combinations” to correct a typographical error. The phrase “, especially an electro-acoustic resonator” is removed by amendment from claim 12 as suggested by the Examiner to clarify the scope of the claim. Also, claims 4 and 9 are amended to enclose reference characters within parentheses.

Claim Rejections under 35 U.S.C. 112, second paragraph

Claims 4 and 9-11 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention. In particular, claim 4 was rejected for reciting a diffusion barrier between electrode layers without antecedent basis for electrodes comprising multiple layers. Claim 9 was rejected for reciting “the diffusion barrier” without antecedent basis. Also, claims 10 and 11 were rejected for claiming thicknesses and resonant frequencies “in the region of” a specified value.

Claim 4 is amended as suggested by the Examiner to depend from claim 3, and to clarify that the diffusion barrier is located between stacked conductive materials of the electrode layers. Claim 9 is similarly amended to depend from claim 4, providing antecedent basis for “the diffusion barrier,” and further amended to clarify that the diffusion barrier is between the stacked conductive materials of the electrode layers as suggested by the Examiner. Applicants submit that claims 4 and 9, as amended, are definite. Consequently, Applicants respectfully request that the rejections of claims 4 and 9 under 35 U.S.C. 112, second paragraph, be withdrawn.

In regard to the rejections of claims 10 and 11, Applicants respectfully note that the Office Action does not provide a proper basis for the rejection. In particular, the rejection asserts that the phrases “in the region of 2 GHz” for the resonant frequency and “in the region of 200 nm” for the thickness of a top molybdenum layer, along with other electrode thicknesses, “is vague and indefinite since it cannot be understood in light of

the specification what range would be considered 'in the region of' the recited values." Office Action, sentence spanning pages 4 and 5.

Section 2173.05(b) of the MPEP relates to the use of relative terminology in claims. This section states:

The fact that claim language, including terms of degree, may not be precise, does not automatically render the claim indefinite under 35 U.S.C. 112, second paragraph. *Seattle Box Co., v. Industrial Crating & Packing, Inc.*, 731 F.2d 818, 221 USPQ 568 (Fed. Cir. 1984). Acceptability of the claim language depends on whether one of ordinary skill in the art would understand what is claimed, in light of the specification. MPEP 2173.05(b).

The MPEP in this section goes on to describe circumstances under which several relative words were used in claims, and the ultimate determination of definiteness or indefiniteness. In relation to the use of the word "essentially," the MPEP states:

The phrase "a silicon dioxide source that is essentially free of alkali metal" was held to be definite because the specification contained guidelines and examples that were considered sufficient to enable a person of ordinary skill in the art to draw a line between unavoidable impurities in starting materials and essential ingredients. *In re Marosi*, 710 F.2d 799, 218 USPQ 289 (CCPA 1983). The court further observed that it would be impractical to require applicants to specify a particular number as a cutoff between their invention and the prior art. MPEP 2173.05(b).

In this case, the specification includes tables of experimental results relating to the thicknesses of electrodes in various claimed embodiments and the resulting coupling factors in Figs. 4-7. These tables provide "guidelines and examples" which, according to the MPEP and *In re Marosi*, enable a person of ordinary skill in the art to understand what is claimed.

As the specification states in relation to Fig. 4, "According to the table the optimum thicknesses of Molybdenum are seen to be in the region of T3= 200nm for the top electrode 15 and of T4=300nm for the bottom electrode." Paragraph 33. One skilled in the art would easily be able to discern from Fig. 4 which values indicate the optimum thicknesses simply by observing which thicknesses resulted in the highest values on the table. Since determination of optimal values is enabled by the specification, the extent of the "region" is also clearly defined to one skilled in the art, in light of the specification. In addition, the use of the word "region" as it relates to the resonant frequency of the

resonator would be commonly understood by one skilled in the art, in light of the specification, to include a range of frequencies used in 2G and 3G telecommunications having a resonant frequency of around 2GHz (see paragraph 0002 and 0032).

Since the use of the word “region” in relation to thickness of the electrodes and resonant frequency would be understood by one skilled in the art, in light of the specification, the use of the word “region” does not render the claims indefinite. Consequently Applicants respectfully request that the rejections of claims 10 and 11 under 35 U.S.C. 112, second paragraph, be withdrawn.

Claim Rejections under 35 U.S.C. 102 and 103

Claims 1, 2, and 12 were rejected under 35 U.S.C. 102(b) as being anticipated by Weber (U.S. Pat. No. 5,864,261, hereinafter Weber). Additionally, claims 1-3 and 12 were rejected under 35 U.S.C. 102(e) as being anticipated by Bradley et al. (U.S. Pat. No. 6,874,211, hereinafter Bradley). Additionally, claims 1, 3, 4, 6, and 12 were rejected under 35 U.S.C. 102(b) as being anticipated by Zimnicki et al. (U.S. Pat. No. 6,249,074, hereinafter Zimnicki). Additionally, claims 1-5, 7-9, and 12 were rejected under 35 U.S.C. 103(a) as being unpatentable over Lakin (U.S. Pat. No. 6,291,931, hereinafter Lakin) taken together with Bradley such that either reference can modify the other. Additionally, claims 10 and 11 were rejected under 35 U.S.C. 103(a) as being unpatentable over Bradley in view of Ylilammi (U.S. Pat. No. 6,051,907, hereinafter Ylilammi). However, Applicants respectfully submit that these claims are patentable over Weber, Bradley, Zimnicki, Lakin, and Ylilammi for the reasons provided below.

Independent Claim 1

Weber

Claim 1 as amended is directed toward a resonator with a membrane structure or FBAR. In contrast, as stated in the Office Action, Weber is directed toward “a solidly mounted bulk acoustic resonator (SBAR)” structure. Consequently, Applicants respectfully submit that Weber does not disclose all of the limitations of claim 1 because Weber does not disclose a resonator with a membrane structure or FBAR. Accordingly,

Applicants request that the rejection of amended claim 1 based on Weber under 35 U.S.C. 102(b) be withdrawn.

Bradley

Claim 1 also recites a “top electrode layer . . . that is thinner than [a] bottom . . . electrode layer.” In contrast, Bradley does not disclose an acoustic resonator with a top electrode layer that is thinner than a bottom electrode layer. On the contrary, Bradley clearly discloses an embodiment with top and bottom electrodes having the same thickness of 1500 Angstroms in relation to Fig. 1. Bradley, Column 3, lines 45-50. In no other described embodiment does Bradley describe the thickness of a bottom electrode. Since the thickness of the bottom electrode in other embodiments is unknown, and the top electrode is not described in terms relative to the bottom electrode, Bradley does not disclose an embodiment with a top electrode thinner than a bottom electrode.

The Office Action calls the embodiment described in Figs. 3A and 3B “similar” to Figs. 1 and 2 and imputes the thickness of electrodes described in Fig. 1 to the embodiments of Figs. 3A and 3B. In asserting that all top and bottom electrodes in all embodiments described in Figs. 3A and 3B are formed at a thickness of 1500 Angstroms, the Office Action relies on column 5, lines 64-67. Line 67 is the last line in column 5, but the sentence continues to the next column. Lines 1 and 2 of column 6 complete the sentence and place this section of the application in proper context, as the full sentence states “Similar to the apparatus 10 of FIG. 1 or apparatus 40 of FIG. 2, the apparatus 70 may include a cavity 81 (‘first cavity’) over which a resonator 80 (‘first resonator’) is fabricated” (column 5, line 64, to column 6, line 2, emphasis added).

Bradley clearly limits the “similarity” between Figs. 3A and 3B and Figs. 1 and 2 to the presence of a cavity, which is unrelated to the thickness of the electrodes. Bradley does not state or even infer that the thickness of bottom electrodes in Figs. 3A and 3B are the same or even similar to those in Figs. 1 and 2. Indeed, Bradley does not describe the thickness of the bottom electrode of Figs. 3A and 3B in either absolute terms or relative terms.

The Office Action goes on to state that “the top electrode layer 76 is reduced in thickness by several hundred Angstroms (see col. 6, lines 61-67) so as to be thinner than

the bottom electrode layer 72 . . .” Office Action, page 6, lines 12-14. However, Bradley only discloses that the top electrode layer of the first resonator 80 is thinner than the top electrode layer of the second resonator 90, so that the two attached resonators have different resonant frequencies. Bradley never discloses that the top electrode layer of any resonator is thinner than the bottom electrode layer of the resonator.

For the reasons presented above, Bradley does not disclose all of the limitations of the claim because Bradley does not disclose a resonator with a top electrode layer thinner than a bottom electrode layer, as recited in the claim. Accordingly, Applicants respectfully assert claim 1 is patentable over Bradley because Bradley does not disclose all of the limitations of the claim. Consequently, Applicants request that the rejection of amended claim 1 based on Bradley under 35 U.S.C. 102(e) be withdrawn.

Zimnicki

Claim 1 as amended recites a resonator with a membrane structure or FBAR. In contrast, Zimnicki does not disclose an FBAR. Consequently, Applicants respectfully submit that Zimnicki does not disclose all of the limitations of claim 1 because Zimnicki does not disclose an FBAR. Accordingly, Applicants request that the rejection of amended claim 1 based on Zimnicki under 35 U.S.C. 102(b) be withdrawn.

Lakin and Bradley

Claim 1 recites a “top electrode layer . . . that is thinner than [a] bottom . . . electrode layer.” As described above, Bradley fails to teach a top electrode layer that is thinner than a bottom electrode layer. As stated by the Examiner, “Lakin does not disclose the top electrode being thinner than the bottom electrode.” Office Action, page 9, first sentence. Since neither Bradley nor Lakin teaches a top electrode layer that is thinner than a bottom electrode layer, as recited in claim 1, Applicants submit that claim 1 is patentable over Lakin and Bradley. Consequently, Applicants request that the rejection of amended claim 1 based on Lakin and Bradley under 35 U.S.C. 103(a) be withdrawn.

Dependent Claims 3-12

Claims 3-12 depend from and incorporate all of the limitations of independent claim 1. Applicants respectfully assert claims 3-12 are allowable based on an allowable base claim. Consequently, Applicants request that the rejections of claims 3-12 be withdrawn. Additionally, each of claims 3-12 may be allowable for other reasons.

CONCLUSION

Applicants respectfully request reconsideration of the claims in view of the amendments and remarks made herein. A notice of allowance is earnestly solicited.

At any time during the pendency of this application, please charge any fees required or credit any over payment to Deposit Account **50-3444** pursuant to 37 C.F.R. 1.25. Additionally, please charge any fees to Deposit Account **50-3444** under 37 C.F.R. 1.16, 1.17, 1.19, 1.20 and 1.21.

Respectfully submitted,

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